

Summary

Body Growth

Describe major changes in body size, proportions, muscle-fat makeup, and skeletal growth over the first two years.

- Height and weight gains are greater during the first two years than at any other time after birth. Body fat is laid down quickly during the first nine months, whereas muscle development is slow and gradual. Parts of the body grow at different rates, following the **cephalocaudal** and **proximodistal trends**, resulting in changing body proportions.
- Skeletal age**, a measure based on the number of **epiphyses** and the extent to which they are fused, is the best way to estimate the child's overall physical maturity. At birth, the bones of an infant's skull are separated by six gaps, or **fontanels**, which permit the skull to expand as the brain grows. The first tooth emerges around age 6 months. By age 2, the average child has 20 teeth.

Brain Development

Describe brain development during infancy and toddlerhood, current methods of measuring brain functioning, and appropriate stimulation to support the brain's potential.

- Early in development, the brain grows faster than any other organ of the body. Once **neurons** are in place, they rapidly form **synapses**, or connections, and release chemicals called **neurotransmitters** that cross synapses to send messages to other neurons. During the peak period of synaptic growth in any brain area, many surrounding neurons die. Stimulation determines which neurons will survive and establish new synapses and which will lose their connective fibers through **synaptic pruning**. **Glial cells**, which are responsible for **myelination**, multiply dramatically from the end of pregnancy through the second year, contributing to large gains in brain weight.
- Neurophysiological methods for measuring brain functioning include those that detect changes in electrical activity in the cerebral cortex (EEG, ERPs), neuroimaging techniques (PET, fMRI), and NIROT, which uses infrared light and is suitable for infants and young children.
- The **cerebral cortex** is the largest, most complex brain structure and the last to stop growing. Its regions develop in the general order in which various capacities emerge in the growing child, with the frontal lobes having the most extended period of development. The hemispheres of the cerebral cortex specialize, a process called **lateralization**. In the first few years of life, there is high **brain plasticity**, with many areas not yet committed to specific functions.
- Both heredity and early experience contribute to brain organization. Stimulation of the brain is essential during sensitive periods—periods in which the brain is developing most rapidly. Prolonged early deprivation, as in some babies reared in orphanages, can disrupt brain growth and interfere with the brain's capacity to manage stress, with long-term physical and psychological consequences.
- Appropriate early stimulation promotes **experience-expectant brain growth**, which depends on ordinary experiences. No evidence exists for a sensitive period in the first few years for **experience-dependent brain growth**—additional growth and refinement of established brain structures as a result of specific learning experiences. In fact, environments that overwhelm children with inappropriately advanced expectations can undermine the brain's potential.



How does the organization of sleep and wakefulness change over the first two years?

- Infants' changing arousal patterns are primarily affected by brain growth. Periods of sleep and wakefulness become fewer but longer over the first two years, conforming to a night-day schedule.
- The Western practice of isolating young infants to promote sleeping through the night, which is rare elsewhere in the world, may be at odds with their neurological development. When babies sleep with their parents, they shift toward an adultlike sleep-wake schedule only at the end of the first year.

Influences on Early Physical Growth

Cite evidence indicating that heredity, nutrition, and parental affection and stimulation contribute to early physical growth.

- Twin and adoption studies reveal that heredity contributes to body size and rate of physical growth.
- Breast milk is ideally suited to infants' growth needs and offers protection against disease. In poverty-stricken areas of the world, breastfeeding prevents malnutrition and infant death. Breastfed and bottle-fed babies in industrialized nations do not differ in emotional adjustment, but some studies report a small advantage in intelligence test performance for children and adolescents who were breastfed.
- Most infants and toddlers can eat nutritious foods freely without risk of becoming overweight. However, the relationship between rapid weight gain in infancy and obesity at older ages is strengthening, perhaps because of a rise in unhealthy early feeding practices, in which babies are given high-fat foods and sugary drinks.
- Marasmus** and **kwashiorkor** are dietary diseases caused by malnutrition that affect many children in developing countries. Affected children often suffer from disrupted body and brain growth and intellectual and emotional impairments. **Nonorganic failure to thrive** illustrates the importance of parental affection and stimulation for normal physical growth.



Learning Capacities

Describe infant learning capacities, the conditions under which they occur, and the unique value of each.

- Classical conditioning** is based on the infant's ability to associate events that usually occur together in the everyday world. In this form of learning, a neutral stimulus is paired with an **unconditioned stimulus** (UCS) that produces a reflexive, **unconditioned response** (UCR). Once learning has occurred, the neutral stimulus, now called the **conditioned stimulus** (CS), alone elicits a similar response, called the **conditioned response** (CR). Young infants can be classically conditioned when the pairing of a CS with a UCS has survival value, as in the feeding situation. However, classical conditioning of fear is difficult before age 6 months.
- In **operant conditioning**, as infants act on their environment, their behavior is followed by **reinforcers**, which increase the occurrence of a preceding behavior. Alternatively, **punishment** involves removing a desirable stimulus or presenting an unpleasant one to decrease the occurrence of a response. In young infants, interesting sights and sounds and pleasurable caregiver interaction serve as effective reinforcers.
- Habituation** and **recovery** reveal that at birth, babies are attracted to novelty. Novelty preference (recovery to a novel stimulus) assesses recent memory, whereas familiarity preference (recovery to the familiar stimulus) assesses remote memory.
- Newborns also have a primitive ability to imitate adults' facial expressions and gestures. **Imitation** is a powerful means of learning,

which contributes to the parent-infant bond. However, whether newborn imitation is a voluntary capacity remains controversial.

Motor Development

Describe the general course of motor development during the first two years, along with factors that influence it.

- In general, motor development follows the **cephalocaudal** and **proximodistal trends**, although some milestones deviate sharply from these patterns. According to **dynamic systems theory of motor development**, children acquire new motor skills by combining existing skills into increasingly complex systems of action. Each new skill is a joint product of central nervous system development, the body's movement possibilities, the child's goals, and environmental supports for the skill.
- Movement opportunities and a stimulating environment profoundly affect motor development, as shown by research on infants reared in deprived institutions. Cultural values and child-rearing customs contribute to the emergence and refinement of early motor skills.
- During the first year, infants perfect their reaching and grasping. The poorly coordinated **prereaching** of the newborn period drops out. As depth perception and control of body posture and of arm and hand movements improve, reaching becomes more flexible and accurate, and the clumsy **ulnar grasp** is transformed into a refined **pincer grasp** by the end of the first year.
- Young children are not physically and psychologically ready for toilet training until the months following their second birthday. Effective training techniques include regular toileting routines, gentle encouragement, and praise.

Perceptual Development

What changes in hearing and in depth, pattern, object, and intermodal perception take place during infancy?

- Over the first year, infants organize sounds into complex patterns and readily detect sound regularities that facilitate later language learning. They show a preference for listening to human speech over nonspeech, and they gradually become more responsive to the sounds of their own language and use their remarkable ability to analyze the speech stream to detect meaningful units of speech.



- Rapid maturation of the eye and visual centers in the cerebral cortex supports the development of focusing, color discrimination, and visual acuity during the first few months. The ability to scan the environment and track moving objects also improves.
- Research on depth perception reveals that responsiveness to motion develops first, followed by sensitivity to binocular and then to pictorial depth cues. Experience in crawling enhances depth perception and other aspects of three-dimensional understanding. However, babies must undergo new learning about depth as they master new postures.
- Contrast sensitivity** accounts for infants' early pattern preferences. At first, babies stare at single, high-contrast features. At 2 to 3 months, they thoroughly explore internal features of a pattern and start to detect pattern organization. Over time, they discriminate increasingly complex and meaningful patterns.
- Newborns prefer to look at photos and simplified drawings of faces, but whether they have a built-in tendency to orient toward human faces is a matter of dispute. Newborns are sensitive to the broad outlines of their mother's face; at 2 months, they recognize and prefer her facial features. Around 3 months, they make fine distinctions between the features of different faces. From 5 months on, they perceive emotional expressions as meaningful wholes.
- At birth, **size and shape constancy** help babies build a coherent world of objects. At first, infants depend on motion and spatial arrangement to identify objects. After 4 months of age, they rely increasingly on other features, such as distinct shape, color, and texture.
- At 4 months, infants first perceive the path of a ball moving back and forth behind a screen as continuous. Between 4 and 5 months, they can monitor increasingly intricate paths of objects.
- From the start, infants are capable of **intermodal perception**, quickly combining information across sensory modalities, often after a single exposure to a new situation. Detection of **amodal sensory properties**, such as common rate rhythm, duration, and intensity, may provide the basis for detecting many intermodal matches. Intermodal sensitivity facilitates processing of both the physical and social worlds. And when provided with intermodal stimulation, babies show faster learning.

Explain the Gibson's differentiation theory of perceptual development.

- According to **differentiation theory**, perceptual development is a matter of detecting increasingly fine-grained **invariant features** in a constantly changing perceptual world. Perceptual differentiation is guided by discovery of **affordances**—the action possibilities that a situation offers the individual.

Important Terms and Concepts

affordances (p. 203)
amodal sensory properties (p. 202)
brain plasticity (p. 172)
cephalocaudal trend (p. 167)
cerebral cortex (p. 171)
classical conditioning (p. 183)
conditioned response (CR) (p. 184)
conditioned stimulus (CS) (p. 184)
contrast sensitivity (p. 197)
differentiation theory (p. 202)
dynamic systems theory of motor development (p. 189)
epiphyses (p. 167)
experience-dependent brain growth (p. 176)

experience-expectant brain growth (p. 176)
fontanels (p. 168)
glial cells (p. 169)
habituation (p. 185)
imitation (p. 186)
intermodal perception (p. 202)
kwashiorkor (p. 181)
lateralization (p. 172)
marasmus (p. 181)
myelination (p. 169)
neurons (p. 168)
neurotransmitters (p. 168)
nonorganic failure to thrive (p. 182)
operant conditioning (p. 184)

pincer grasp (p. 191)
prereaching (p. 190)
proximodistal trend (p. 167)
punishment (p. 184)
recovery (p. 185)
reinforcer (p. 184)
shape constancy (p. 201)
size constancy (p. 201)
skeletal age (p. 167)
synapses (p. 168)
synaptic pruning (p. 169)
ulnar grasp (p. 191)
unconditioned response (UCR) (p. 183)
unconditioned stimulus (UCS) (p. 183)

Summary

Body Growth

Describe changes in body size, proportions, and skeletal maturity during early childhood.

- Gains in body size taper off in early childhood. Body fat also declines, and children become longer and leaner. In various parts of the skeleton, new epiphyses emerge, where cartilage hardens into bone. Individual differences in body size and rate of physical growth are more apparent than in infancy and toddlerhood.
- By the end of the preschool years, children start to lose their primary teeth. Care of primary teeth is essential because diseased baby teeth can affect the health of permanent teeth. Childhood tooth decay remains common, especially among low-SES children.

What makes physical growth an asynchronous process?

- Body systems differ in their rates of growth. The **general growth curve** describes change in body size: rapid during infancy, slower in early and middle childhood, rapid again during adolescence. Exceptions to this trend include the genitals, the lymph tissue, and the brain.

Brain Development

Describe brain development in early childhood.

- During the preschool years, neural fibers in the brain continue to form synapses and myelinate. By this time, many cortical regions

have overproduced synapses, and *synaptic pruning* occurs. To make room for the connective structures of active neurons, many surrounding neurons die, leading to reduced brain plasticity.

- For most children, the left hemisphere of the cerebral cortex develops ahead of the right hemisphere, supporting young children's rapidly expanding language skills.
- Hand preference, which reflects an individual's **dominant cerebral hemisphere**, strengthens during early childhood. Research on handedness supports the joint contribution of nature and nurture to brain lateralization.
- Although left-handedness is associated with developmental problems, the great majority of left-handed children have no such problems. Left- and mixed-handed youngsters are more likely to display outstanding verbal and mathematical talents.
- During early childhood, connections are established between brain structures. Fibers linking the **cerebellum** to the cerebral cortex grow and myelinate, enhancing motor coordination. The **reticular formation**, responsible for alertness and consciousness; the **hippocampus**, which plays a vital role in memory; and the **corpus callosum**, which connects the two cortical hemispheres, also form synapses and myelinate.

Influences on Physical Growth and Health

Explain how heredity influences physical growth.

- Heredity influences physical growth by controlling production and release of two vital hormones from the **pituitary gland**: **growth hormone (GH)**, which affects the development of almost all body tissues, and **thyroid-stimulating hormone (TSH)**, which affects brain growth and body size.

Describe the effects of emotional well-being, restful sleep, nutrition, and infectious disease on physical growth and health in early childhood.

- Emotional well-being continues to influence body growth and health in early childhood. Extreme emotional deprivation can lead to **psychosocial dwarfism**.
- Restful sleep contributes to body growth directly, through the release of GH during sleep, and indirectly, by contributing positively to family functioning. Bedtime routines are helpful for Western children, who—unlike children in many non-Western cultures—generally sleep alone. Most preschoolers awaken occasionally at night, and some may suffer from sleep disorders. A few experience sleepwalking or sleep terrors, which run in families, suggesting a genetic influence, but these problems can also be triggered by stress or extreme fatigue.
- As growth rate slows, preschoolers' appetites decline, and they often become picky eaters. Young children's social environments powerfully influence their food preferences. Modeling by others, repeated exposure to new foods, and a positive emotional climate at mealtimes can promote healthy, varied eating in young children.
- Many children in North America and in developing countries suffer from dietary deficiencies—most commonly, a lack of sufficient protein and essential vitamins and minerals. These deficiencies are associated with attention difficulties, academic and behavior problems, and greater susceptibility to infectious diseases. Disease also contributes to malnutrition, especially when intestinal infections cause persistent diarrhea. In developing countries, inexpensive oral rehydration therapy (ORT) can prevent most developmental impairments and deaths due to diarrhea.
- Immunization rates are lower in the United States than in other industrialized nations because many economically disadvantaged children lack access to necessary health care. Parental stress also contributes, as do widespread misconceptions about the dangers of immunization.
- Child-care attendance is associated with a rise in childhood illness, especially otitis media, or middle ear infection. Frequent ear infections predict delayed language progress, social isolation, and poorer academic performance after school entry—outcomes that can be prevented by high-quality child care and screening for otitis media.

What factors increase the risk of unintentional injuries, and how can childhood injuries be prevented?

- Unintentional injuries are the leading cause of childhood mortality. Injury victims are more likely to be boys; to be temperamentally irritable, inattentive, and negative; and to live in stressed, poverty-stricken, crowded family environments. Among developed nations, injury deaths are high in the United States and Canada. They are

even higher in developing countries, where they may soon exceed disease as the leading cause of childhood deaths.

- Effective approaches to preventing childhood injuries include passing laws that promote child safety; creating safer home, travel, and play environments; relieving sources of family stress; improving public education; and changing parent and child behaviors.

Motor Development

Cite major milestones of gross and fine motor development in early childhood.

- During early childhood, children continue to integrate previously acquired motor skills into more complex dynamic systems of action. As the child's center of gravity shifts toward the trunk, balance improves, paving the way for new gross motor achievements. Preschoolers' gaits become smooth and rhythmic; they run, jump, hop, gallop; eventually skip, throw, and catch; and generally become better coordinated.
- Increasing control of the hands and fingers leads to dramatic improvements in fine motor skills. Preschoolers gradually dress themselves and use a fork and knife.
- By age 3, children's scribbles become pictures. As perception, language, memory, and fine motor capacities improve with age, children's drawings increase in complexity and realism. Children's drawings are also influenced by their culture's artistic traditions.
- Around age 4, children's writing shows some distinctive features of print, but only gradually do children realize that writing stands for language. Between 3 and 5 years, children experiment with pencil grip; by age 5, most use an adultlike grip that maximizes stability and writing efficiency.
- Advances in perception and exposure to written materials contribute to progress in discriminating individual letters. When parents and teachers support children's efforts to print, preschoolers are more advanced in writing and other aspects of literacy development.

Describe individual differences in preschoolers' motor skills and ways to enhance motor development in early childhood.

- Body build and opportunity for physical play affect early childhood motor development. Sex differences that favor boys in skills requiring force and power and girls in skills requiring good balance and fine movements are partly genetic, but social pressures exaggerate them.
- Children master the motor skills of early childhood through informal play experiences, with little benefit from exposure to formal training. Richly equipped play environments that accommodate a wide range of physical abilities are important. Emphasizing pleasure in motor activities is the best way to foster motor development during the preschool years.

Important Terms and Concepts

cerebellum (p. 298)

corpus callosum (p. 299)

dominant cerebral hemisphere (p. 297)

general growth curve (p. 296)

growth hormone (GH) (p. 301)

hippocampus (p. 299)

pituitary gland (p. 301)

psychosocial dwarfism (p. 302)

reticular formation (p. 298)

thyroid-stimulating hormone (TSH) (p. 302)

Summary

Body Growth

Describe changes in body size, proportions, and skeletal maturity during middle childhood.

- School-age children's growth is slow and regular. On average, they add about 2 to 3 inches in height and 5 pounds in weight each year. By age 9, girls overtake boys in physical size.



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- Evolutionary adaptations to particular climates, food resources, and infectious diseases contribute to large individual and ethnic variations in physical growth. **Secular trends in physical growth** have occurred in industrialized nations. Because of improved health and nutrition, many children are growing larger and reaching physical maturity earlier than their ancestors.

- During middle childhood, bones continue to lengthen and broaden. All 20 primary teeth are replaced by permanent ones. Tooth decay affects over half of North American school-age children, with especially high levels among low-SES children. One-third of school-age children suffer from **malocclusion**, making braces common by the end of elementary school.

Describe brain development in middle childhood.

- Only a small gain in brain size occurs during middle childhood. White matter (myelinated nerve fibers) increases steadily, especially in the frontal lobes of the cerebral cortex, the parietal lobes, and the corpus callosum. In contrast, gray matter (neurons and supportive material) declines as a result of synaptic pruning, and lateralization of the cerebral hemispheres increases. Brain development during the school years is believed to involve neurotransmitter and hormonal influences.

Common Health Problems

Describe the overall status of children's health during middle childhood.

- School-age children from economically advantaged homes are at their healthiest, benefiting from the cumulative effects of good nutrition and rapid development of the body's immune system. At the same time, a variety of health problems do occur, many of which are more common among low-SES children.
- The most common vision problem, **myopia**, is influenced by heredity, early biological trauma, and time spent reading and doing other close work. It is one of the few health conditions that increase with family education and income. Although ear infections decline

during the school years, many low-SES children experience some hearing loss because of chronic, untreated otitis media.

Describe the causes and consequences of serious nutritional problems in middle childhood, giving special attention to obesity.

- Poverty-stricken children in developing countries and in North America continue to suffer from malnutrition. Malnutrition that persists for many years usually results in permanent physical and mental damage. Severely malnourished, growth-stunted children display a heightened stress response, altered production of neurotransmitters in the brain, and greater vulnerability to obesity after their diets improve.
- Overweight and **obesity** have increased dramatically in both industrialized and developing nations, especially in the United States. Although heredity accounts for a tendency to gain weight, parental feeding practices, maladaptive eating habits, lack of exercise, and Western high-fat diets are more powerful influences. Obese children are often socially rejected, are more likely to report feeling depressed, and display more behavior problems than their normal-weight peers.
- Family-based interventions in which parents and children revise eating patterns, engage in regular daily exercise, and reinforce one another's progress are the most effective approaches to treating childhood obesity. Rewarding obese children for reducing sedentary time is effective in getting them to enjoy and engage in more physical activity. Schools can help by ensuring regular physical activity and serving healthier meals.

What factors contribute to nocturnal enuresis and to asthma, and how can these health problems be reduced?

- Heredity is responsible for most cases of **nocturnal enuresis**, through a failure of muscular responses that inhibit urination or a hormonal imbalance that permits too much urine to accumulate. The most effective treatment is a urine alarm that works according to conditioning principles.
- Over the past 30 years, the number of children with **asthma** has more than doubled. This chronic disease, the most frequent cause of school absence and childhood hospitalization, occurs more often among African-American and poverty-stricken children, perhaps because of inner-city pollution, stressful home lives, and lack of access to good health care. Childhood obesity is also a factor. Children with severe chronic illnesses are at risk for academic, emotional, and social difficulties. Interventions that



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foster positive family interactions and help parent and child cope with the disease improve adjustment.

Describe changes in the occurrence of unintentional injuries during middle childhood, and cite effective interventions.

- The rate of unintentional injury increases from middle childhood into adolescence. Motor vehicle accidents (with children as passengers or pedestrians) and bicycle accidents are the leading causes. Highly active, impulsive children, especially boys, often do not implement their safety knowledge and are particularly susceptible to injury.
- Effective school-based safety education programs use modeling and rehearsal of safety practices, reward children for good performance, and provide occasional booster sessions. Parents also must be educated about children's age-related safety capacities. One vital safety measure is insisting that children wear protective bicycle helmets, which dramatically reduces the risk of serious head injury.

Health Education

What can parents and teachers do to encourage good health practices in school-age children?

- Besides providing health-related information, adults must reduce health hazards in children's environments, coach children in good health practices, and model and reinforce these behaviors.

Motor Development and Play

Cite major changes in gross and fine motor development during middle childhood.

- Gradual increases in body size and muscle strength support refinements in many gross motor skills. Gains in flexibility, balance, agility, and force occur. In addition, improvements in responding only to relevant information and in reaction time contribute to athletic performance.
- Fine motor development also improves. Handwriting becomes more legible, and children's drawings show dramatic increases in organization, detail, and representation of depth.

Describe individual differences in motor performance during middle childhood.

- Wide individual differences in children's motor capacities are influenced by both heredity and environment, including such factors as body build, parental encouragement, and opportunities to take lessons. Gender stereotypes, which affect parental

expectations for children's athletic performance, largely account for school-age boys' superiority on a wide range of gross motor skills. Greater emphasis on skill training for girls and attention to their athletic achievements can help increase their involvement and performance.

What qualities of children's play are evident in middle childhood?

- Organized games with rules become common during the school years. Children's informally organized games support many aspects of emotional and social development. Expansion of adult-organized youth sports programs is associated with increased self-esteem and social competence in most players, but for some



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children, adult overemphasis on competition and winning promotes undue anxiety and avoidance of sports. Promoting effort, improvement, participation, and teamwork makes organized sports enjoyable and beneficial for self-esteem.

- Some features of children's physical activity reflect our evolutionary past. **Rough-and-tumble play** may once have been important for the development of fighting skill and may help children establish a **dominance hierarchy**. In middle childhood, dominance hierarchies become increasingly stable, especially among boys, and serve the adaptive function of limiting aggression among group members.

What steps can schools take to promote physical fitness in middle childhood?

- In addition to providing an opportunity for physical activity, school recess is a rich context for child-organized games and social interaction. Regular, unstructured recess promotes both physical and social skills and boosts academic achievement.
- Physical education classes help ensure that all children have access to the physical, cognitive, and social benefits of exercise and play. Daily classes emphasizing informal games that most children can perform well translate into lifelong psychological and physical health benefits.

Important Terms and Concepts

asthma (p. 422)
dominance hierarchy (p. 432)
malocclusion (p. 414)

myopia (p. 415)
nocturnal enuresis (p. 422)
obesity (p. 417)

rough-and-tumble play (p. 431)
secular trends in physical growth (p. 413)

Summary

Conceptions of Adolescence

How have conceptions of adolescence changed over the twentieth century?

- Early biologically oriented theories viewed **puberty** as a period of inevitable storm and stress resulting from biological upheaval. An alternative perspective regarded the social and cultural environment as entirely responsible for the variability in adolescent adjustment.
- Current research shows that **adolescence** is neither biologically nor socially determined but a joint product of biological, psychological, and social forces. In cultures that require many years of education for successful participation in the work life of the community, adolescence is greatly extended.

Puberty: The Physical Transition to Adulthood

Describe body growth, motor performance, and sexual maturation during puberty.

- Hormonal changes under way in middle childhood initiate puberty, which arrives, on average, two years earlier for girls than for boys. The first outward sign of puberty is the rapid gain in height and weight known as the **growth spurt**. In early adolescence, the cephalocaudal trend of body growth reverses. Most height gain results from lengthening of the torso. As the body enlarges, girls' hips and boys' shoulders broaden. Girls add more fat, boys more muscle. Because athletic competence is related to peer admiration, some adolescents, mostly boys, use steroids and other dangerous performance-enhancing drugs to boost muscle power.
- Puberty brings slow, gradual improvements in gross motor performance for girls, dramatic gains for boys. Although girls' involvement in high school sports has increased, they still receive less athletic encouragement than boys. The number of North American adolescents participating in regular physical activity and physical education declines over the teenage years.
- Sex hormones regulate changes in **primary and secondary sexual characteristics**. **Menarche** occurs late in the girl's sequence of pubertal events, following the rapid increase in body size. After menarche, growth of the breasts and of pubic and underarm hair are completed. In boys, as the sex organs and body enlarge and pubic and underarm hair appear, **spermarche** takes place. This is followed by growth of facial and body hair and deepening of the voice.

What factors influence the timing of puberty?

- Heredity, nutrition, and overall health contribute to the timing of puberty. Obese girls reach menarche early, whereas girls involved in rigorous athletic training experience it later. Menarche is delayed in poverty-stricken regions of the world with widespread malnutrition and infectious disease. In industrialized nations, both heredity and environment contribute to ethnic variations—for example, earlier age of menarche in African-American than in Caucasian-American girls.

- Girls in conflict-ridden families tend to reach menarche earlier. Both genetic and environmental explanations for this trend exist. Also, improved physical well-being has led to a secular trend toward earlier menarche in industrialized nations. In most countries, the trend either has stopped or has undergone a slight reversal, but in North America and a few European countries, overweight and obesity may account for a modest continuation.

Describe brain development and changes in the organization of sleep and wakefulness during adolescence.

- During puberty, synaptic pruning continues, especially in the frontal lobes, while myelination of neural fibers accelerates and connections among various brain regions strengthen, resulting in more efficient brain functioning. In addition, neurons become more responsive to excitatory neurotransmitters, increasing reactivity to stressful events and pleasurable stimuli.
- Because of changes in the way the brain regulates timing of sleep, adolescents tend to go to bed much later than they did as children, a pattern that strengthens with pubertal growth. Sleep deprivation is associated with poor school performance, depressed mood, and high-risk behaviors.

The Psychological Impact of Pubertal Events

What factors influence adolescents' reactions to the physical changes of puberty?

- Girls generally react to menarche with surprise and mixed emotions, but whether their feelings are primarily positive or negative depends on advance information and support from family members. Boys usually know in advance about spermarche but receive less support for the physical changes of puberty than girls.
- Tribal and village societies often celebrate puberty with an *initiation ceremony*. Customs such as the Jewish bar or bat mitzvah and the Hispanic *quinceañera* resemble initiation ceremonies, but in general, the absence of a widely accepted marker for physical and social maturity in Western industrialized societies makes the process of becoming an adult more confusing.
- Besides higher hormone levels, negative life events and adult-structured situations are associated with adolescents' negative moods. In contrast, teenagers feel upbeat when with friends and in self-chosen leisure activities, making weekend evenings emotional high points.
- Puberty is accompanied by psychological distancing between parent and child. The reaction may be a modern substitute for physical departure from the family, which typically occurs at sexual maturity in primate species. Parent-adolescent conflict also reflects parents' efforts to protect teenagers from such risks as substance use, auto accidents, and early sex.

Describe the impact of maturational timing on adolescent adjustment, noting sex differences.

- Early-maturing boys and late-maturing girls, whose appearance closely matches cultural standards of physical attractiveness, have

a more positive **body image** and usually adjust well in adolescence. In contrast, early-maturing girls and late-maturing boys, who fit in least well physically with peers, tend to experience emotional and social difficulties. Especially for early-maturing girls, negative consequences often persist.

Health Issues

Describe nutritional needs, and cite factors related to serious eating disturbances during adolescence.

- As the body grows, nutritional requirements increase, at a time when the eating habits of young people are the poorest. Many adolescents suffer from iron, calcium, riboflavin, and magnesium deficiencies. Frequency of family meals is associated with healthy eating in teenagers.
- Girls who reach puberty early, who are very dissatisfied with their body images, and who grow up in homes where thinness is emphasized are at risk for serious eating disturbances. Heredity, family influences, and forces in the larger culture combine to give rise to these disorders. **Anorexia nervosa** tends to affect girls with perfectionist personalities, overprotective and controlling mothers, and emotionally distant fathers. The impulsive eating and purging of **bulimia nervosa** is associated with disengaged parenting. Some bulimics, like anorexics, are perfectionists; others lack self-control in eating and in other areas of their lives.

Cite common unintentional injuries in adolescence.

- Motor vehicle collisions are the leading cause of adolescent injury and death. In the United States, firearms cause the majority of other fatal injuries. Sports-related injuries are also common.

Discuss social and cultural influences on adolescent sexual attitudes and behavior.

- The hormonal changes of puberty lead to an increase in sex drive, but social factors affect how teenagers manage their sexuality. Compared with most other cultures, North America is fairly restrictive in typical attitudes toward adolescent sex. Young people receive contradictory messages from the larger social environment. Sexual attitudes and behavior of adolescents have become more liberal, with a slight swing back recently toward more conservative beliefs.
- Early and frequent sexual activity is linked to a variety of factors associated with economic disadvantage. Early and prolonged father absence may contribute uniquely to early sexual activity.

- Many sexually active teenagers do not practice contraception regularly. Adolescent cognitive processes, lack of rewards through meaningful education and work, and weak social supports for responsible sexual behavior underlie the failure of many young people to protect themselves against pregnancy.

Describe factors involved in the development of homosexuality.

- About 2 to 3 percent of young people identify as lesbian, gay, or bisexual. A still-unknown number experience same-sex attraction but have not come out to friends or family. Biological factors, including heredity and prenatal hormone levels, play an important role in homosexuality. Gay and lesbian teenagers face special challenges in establishing a positive sexual identity.

Discuss factors related to sexually transmitted disease and to teenage pregnancy and parenthood.

- Early sexual activity, combined with inconsistent contraceptive use, results in high rates of sexually transmitted diseases (STDs) among U.S. and (to a lesser extent) Canadian teenagers. Many young adults with AIDS contracted HIV as adolescents. An important goal of sex education is prevention of STDs.
- Adolescent pregnancy and parenthood rates are higher in the United States than in many industrialized nations. Although less prevalent than in the United States, teenage pregnancy in Canada is still a problem. A combination of unfavorable life conditions jointly contribute, including economic disadvantage and personal attributes. Adolescent parenthood is associated with high school dropout, reduced chances of marriage, greater likelihood of divorce, and poverty—circumstances that jeopardize the well-being of both adolescent and newborn child. Adolescent parenthood frequently is repeated in the next generation.
- Improved sex education, access to contraceptives, and programs that build social competence help prevent early pregnancy. Adolescent parents benefit from health care and school programs that provide job training and child care. Young mothers fare better when they have access to family relationships that are sensitive to their developmental needs. When teenage fathers stay involved, teenage mothers are less distressed and children develop more favorably.
- What personal and social factors are related to adolescent substance use and abuse?
- Teenage alcohol and drug use is widespread in industrialized nations, although overall drug use has declined since the mid-1990s in the United States and Canada. Most young people are minimal experimenters, who dabble in drug use out of curiosity. But those who move from use to abuse have serious personal, family, school, and peer problems. Programs that work with parents early to reduce family adversity and improve parenting skills and that build teenagers' competence help prevent substance abuse.



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Important Terms and Concepts

adolescence (p. 529)
anorexia nervosa (p. 544)
body image (p. 542)
bulimia nervosa (p. 545)

growth spurt (p. 532)
menarche (p. 535)
primary sexual characteristics (p. 535)
puberty (p. 529)

secondary sexual characteristics (p. 535)
spermarche (p. 536)